APPENDIX A: COMMENTS AND RESPONSES

Comments from the Public Workshop held July 14, 2011 and those received in writing are addressed below.

State ATCM and Federal NSPS Requirements for Stationary Diesel Engines

1. Comment: We support the staff proposal to follow the revised ATCM and not require after-treatment standards to achieve Tier 4 NOx, CO and VOC emission levels for emergency standby engines because they are neither technically effective nor cost effective when applied to emergency engines. Applying selective catalytic reduction systems to emergency engines is problematic for three reasons: 1) they are not effective in reducing NOx levels since the limited time that these engines operate is generally not sufficient to reach required exhaust temperatures for SCR to work, 2) NOx reductions achieved are not cost effective when comparing reductions to the cost of the equipment, and 3) the urea solution used in SCR has a relative short shelf life and will either deteriorate or have to be constantly replaced when not used.

Response: Selective catalytic reduction systems can be an effective emission control technology to reduce NOx emissions. However, based on the typical 15-30 minute testing sessions of emergency standby engines, exhaust temperatures do not reach the elevated temperatures needed by SCR systems in order to heat the catalyst to effectively reduce emissions. Therefore, the SCAQMD staff is recommending that NOx after-treatment not be required for new emergency standby engines.

2. Comment: Rule 1470 should be amended to reflect the changes that CARB made to the Stationary Diesel Engine ATCM and avoid rule amendments that would further promote the misapplication of PM filters on stationary emergency engines.

Response: SCAQMD permitting data indicates that diesel particulate filters have been applied on stationary emergency standby engines throughout the Basin since 2004. Review of the performance history of DPFs used on emergency standby engines in the District has revealed very limited evidence of emergency standby engine failures resulting from DPF use. Those issues identified have been mitigated through implementation of proper maintenance and operation procedures, or were found to be the result of improper installation of a DPF on an incompatible engine. As stated in response to comment #7, SCAQMD staff believes DPFs are reliable, effective means of reducing diesel PM emissions from stationary engines, provided they are installed, operated and maintained in accordance with manufacturer's guidelines. These findings suggest that the application of diesel particulate filters on emergency standby engines is an appropriate means of minimizing the public's exposure to harmful diesel PM emissions.

Under proposed amended Rule 1470, PM emission limits for new stationary emergency standby engines are more stringent than ATCM requirements for these engines; however, the proposed amendments represent less stringent emission limits when compared to existing Rule 1470 requirements. The proposed amendments narrow the applicability of existing Rule 1470 PM requirements, limiting compliance with Tier 4 PM emission limits to new engines located at or 100 meters or less from a sensitive receptor and new engines located more than 100 meters from a sensitive receptor which are unable to demonstrate cancer risk of less than or equal to one in one million. Several other amendments to Rule 1470 are proposed in order to provide consistency with Stationary Diesel Engine ATCM requirements. SCAQMD staff believes the proposed amendments institute pollution prevention and health protection measures which minimize health risks to nearby sensitive receptors.

3. Comment: All references to the California Off-Road Standards in PAR1470 should instead refer to the federal NSPS engine standards. CARB does not certify stationary diesel engines. Stationary diesel engines will only be certified to EPA NSPS standards.

Response: SCAQMD staff recognizes the current certification protocol for new stationary diesel-fueled engines. The PAR 1470 definition of "Certified CI Engine" has been revised to accommodate current stationary engine certification protocol by including text stating that a certified CI engine includes a "…CI engine certified to comply with the new nonroad CI engine emissions standards as specified in 40 CFR, Part 60, Subpart IIII – Standards of Performance for Stationary Compression Ignition Combustion Engines (2006)." SCAQMD staff believes proposed amended rule language in section (c)(2)(C), referencing the PM emission limits in the Off-Road Standards, is appropriate and adequately conveys the District's intent to limit PM emissions from new stationary emergency standby engines.

4. Comment: Proposed Amended Rule 1470 should provide alternative methods of compliance with proposed PM emission limits, because it is difficult to achieve the required 0.01 g/bhp-hr PM emission limit if using a Tier 2/3 engine (with an emission rate of 0.15 g/bhp-hr) and a Verified DPF (with a verified control efficiency of 85%). This engine/DPF combination would result in a calculated PM emission rate of 0.022 g/bhp-hr. Would source testing be required to demonstrate compliance with the 0.01 g/bhp-hr PM limit?

Response: Proposed amendments include provisions for alternative compliance demonstration in section (f)(6). Proposed amendments would allow engine owners/operators to demonstrate compliance with a 0.01 g/bhp-hr PM emission limit by utilizing a certified CI engine that emits PM at a rate of 0.15 g/bhp-hr or less in combination with a CARB Level 3 Verified Diesel Emission Control

Strategy, or an alternative diesel PM control strategy that is equally or more effective (i.e., 85% or greater PM control efficiency) than a Level 3 VDECS. Additionally, compliance may be demonstrated through the use of a Tier 4 certified CI engine that emits PM at a rate of 0.01 g/bhp-hr or less. Source testing may not be required if the permit applicant can provide sufficient data to demonstrate the DPF control efficiency is greater than 85%, or an engine's baseline PM emission rate is equal to or less than the applicable PM standard. CARB VDECs are verified to achieve at least 85% control efficiency for PM, however, DPF manufacturer data may be utilized to demonstrate a DPF is capable of achieving emission reductions greater than 85%. Examples of such data may include written documentation from the DPF manufacturer stating the control efficiency of the DPF on a similar engine.

5. Comment: Several other air districts in California incorporate risk assessments into the emergency engine permitting process, however, they do not recognize PM filters as T-BACT. Instead, they consider compliance with the State ATCM and federal NSPS as T-BACT and require uncontrolled Tier 2/3 engines to comply with a ten in one million MICR threshold. SCAQMD should consider ATCM/NSPS-compliant Tier 2/3 engines as T-BACT.

Response: Following approval of the recent ATCM amendments, the California Air Resources Board 2010 "Regulatory Advisory: Amendments to Requirements for Stationary Compression-Ignition (Diesel) Engines" recognized the need for local districts to be more stringent than the ATCM. CARB's Regulatory Advisory acknowledges that at the local level, air quality management districts may need to further address emissions and health risks from stationary diesel engines. SCAQMD staff is concerned about the health risk from new emergency standby engines, particularly those located at or near sensitive receptors. Rule 1470 currently includes specific provisions for those engines located at or near a school. Similar to the provision for schools, Proposed Amended Rule 1470 narrows the applicability for implementation of Tier 4 PM emission limits by requiring engines located at or 100 meters or less from a sensitive receptor (with the exception of schools which have their own provisions) to meet the current Tier 4 PM emission limit in the state Off-Road Compression Ignition Engine Standards, which would require after-treatment for most engine sizes. Engines located more than 100 meters from sensitive receptors will be required to comply with the health risk levels of Rule 1401(d)(1)(A) (one in one million cancer risk) and a particulate emission rate limit of less than or equal to 0.15 g/bhp-hr. Those engines unable to demonstrate compliance with Rule 1401 risk levels would be required to comply with the current Tier 4 PM emission limits in the Off-Road Standards. Therefore, PAR 1470 provides additional health protection for sensitive receptors and pollution prevention measures to minimize diesel PM emissions.

6. Comment: SCAQMD should keep in mind that Rule 1470 and the State ATCM reflect assumptions made in 2004 that have not come to fruition. At the time the ATCM was initially adopted, it was believed that technology required to meet Tier 4 emission standards would be integrated, certified, and supported by engine manufacturers. These integrated technologies do not exist in the stationary emergency engine market. Forcing engine owners to rely upon multiple equipment vendors to achieve SCAQMD's stated PM emission objectives may result in increased technical hurdles, commercial and compliance risk, and undue economic hardship.

Response: SCAQMD staff recognizes that some engine manufacturers do not intend to supply certified, integrated stationary emergency engine technologies to comply with Tier 4 emission standards for NOx, NMHC, CO, and PM. PAR 1470 would not require compliance with all aspects of the Tier 4 emission standards. Proposed amendments would require some new stationary emergency standby engines to comply with Tier 4 emission limits for PM only. These emission levels may be achieved through the application of CARB Level 3 Verified Diesel Emission Control Strategies (VDECs) on certified Tier 2/3 or Tier 4i diesel engines (depending on engine size). After-market diesel particulate filter installations on stationary emergency standby engines have been achieved in practice on emergency standby engines throughout the District and the State. As discussed in response to comments #2 & 8, SCAQMD permitting data indicates that DPF applications on stationary emergency standby engines have been implemented in the District since 2004.

All diesel emission control strategies verified through the CARB Verification Procedure must demonstrate compliance with minimum emission reduction, durability, and performance requirements. CARB currently has 11 Level 3 VDECs for stationary emergency standby diesel engine applications. Level 3 VDECs are verified to reduce diesel PM by 85 percent or greater and comply with the CARB January 2009 NO2 limit (CCR, Title 13, Section 2702 (f) and section 2706 (a)). The CARB list of verified retrofit technologies for stationary diesel engines can be found at:
http://www.arb.ca.gov/diesel/verdev/vt/stationary.htm.

Diesel Particulate Filters (DPFs)

Performance and Reliability Concerns

7. Comment: The widespread use of DPFs on emergency standby engines may represent a misapplication of technology. Two examples of project failures illustrate how the installation of DPFs can have unforeseen implications. These examples are not provided in an attempt to imply that filters never work.

Example 1 - In 2008, a passive DPF (accompanied by a load bank) was installed on a 1480 bhp engine at a telecommunications center. Additional substantial costs were incurred after filter installation because on-site filter regeneration could not reasonably be maintained and risk of engine damage became unacceptable. The owner has curtailed testing and maintenance operation and is in the process of replacing the passive filter with an actively-regenerating filter. The initial investment of $250,000 in direct costs is now being supplemented by an additional investment of ~$150,000 in direct costs for an active DPF.

Example 2 - Installation of a DPF on a 480 bhp engine at a school in the SCAQMD. High temperature operations were required more frequently than anticipated to ensure proper regeneration. After three years of operation, and after expiration of warranties, the filter plugged and could not be fully cleaned. Resolution of the problem included installation of a load bank, increasing testing and maintenance operating loads (by a factor of four) and increasing testing duration (by a factor of three). The use of the PM filter resulted in unanticipated increased capital and operating costs and a significant increase in fuel use, relative to a similar installation without a PM filter. Furthermore, net emissions benefits may not be as desirable as envisioned.

Response: When installed, maintained, and operated in accordance with manufacturers' specifications and CARB Executive Orders, CARB-verified DPFs are a reliable, effective technology to reduce diesel PM emissions from stationary engines. Because passive DPFs rely on engine exhaust temperature for the oxidation of collected particulate, it is critical that the engine exhaust temperature profile is carefully evaluated under actual operating conditions, to ensure the exhaust temperatures are sufficient for filter regeneration. Engine exhaust temperatures are highly application dependent and can be affected by factors such as excess heat loss in the exhaust system (e.g., insufficient insulation of exhaust components), or over-sized engines that are operated low on their torque/power curve (i.e., operating at low engine loads). Active filters do not rely on engine exhaust temperature to initiate and sustain filter regeneration; however, other factors, such as the engine's PM emission rate, availability of electrical power, and available space for equipment, must be evaluated prior to installation.

Prior to installation of any active or passive DPF, it is critical that the engine duty cycle, PM emission rate, and other operating parameters be carefully evaluated under "typical" engine operating conditions and loads to ensure the DPF is compatible with the engine. A critical factor in the consideration of DPF/engine compatibility is the engine's baseline (uncontrolled) PM emission rate. If the engine's PM emission rate exceeds the DPF manufacturer's allowable limit, the engine exhaust flow is likely to overload the filter's holding capacity and cause significant performance problems. The Executive

Orders for all CARB Level 3 VDECs clearly state the maximum PM emission rate allowable for each control system. Generally, most DPF manufacturers require engines to meet a baseline PM emission rate of 0.2 g/bhp-hr or less. New stationary emergency standby engines are expected to comply with DPF manufacturer PM emission rate specifications, since new emergency standby engines must be certified to meet Tier 2/3 emission standards prior to DPF installation. Proper evaluation and understanding of the operating parameters and conditions specified by the DPF manufacturer and CARB Executive Orders prior to DPF installation are important in maintaining engine operating conditions that are favorable for DPF use.

Typically, emergency electrical generator engines may not generate sufficient engine exhaust temperatures to sustain filter regeneration during routine maintenance and testing operations because they usually operate at low loads (i.e., without an electrical load on the generator) which result in lower engine exhaust temperatures. During maintenance and testing or for periodic filter regeneration, some emergency standby generator engines may use a load bank to simulate an electrical load on the generator, thereby increasing the load on the engine and increasing the exhaust temperature to initiate and sustain filter regeneration. For those emergency standby generator engines which typically operate at low or highly variable loads and/or engine exhaust temperatures, permanently installed load banks with automatic load controllers may be utilized to aid in maintaining consistent generator loads/exhaust temperatures suitable for DPF regeneration. In other cases, where increased loads and/or exhaust temperatures are necessary only during maintenance and testing sessions (i.e., where typical engine load/exhaust temperature during emergency use would be sufficient for regeneration), portable load banks may be utilized to perform periodic load bank testing and DPF regeneration. In lieu of load bank use, emergency generator engine operators may place an electrical load on the generator by utilizing the generator for its designed purpose (e.g., switch to building electrical load). However, in some cases this may not be feasible or desirable due to the short loss of power between the time a primary power source is shut down to the time the emergency generator starts and begins generating electricity to support the power loss. Another option available for emergency generator engines which typically operate at low loads and/or exhaust temperatures, is the use of actively regenerating DPFs, which do not rely on available engine exhaust heat and do not require minimum NOx:PM ratios in order to initiate and sustain filter regeneration.

8. Comment: The proposed amendments to Rule 1470 warrant further study, because engine manufacturers and service providers have voiced their concerns about the possible failure of emergency generators due to the use of PM filters.

Response: Information collected regarding DPF use on stationary diesel engines and research regarding the use of DPFs on engines permitted in the District indicates that DPFs are technologically feasible for stationary emergency engine applications. SCAQMD staff consulted engine manufacturers, engine dealers, DPF manufacturers, engine/DPF service providers, and engine/DPF end users to evaluate the performance history of DPFs used on emergency standby engines in the District. Findings suggested that reported issues with DPFs used on emergency engines primarily resulted from improper installation, maintenance, and/or operation, rather than from a specific problem with the DPF hardware. SCAQMD staff believes that when installed, operated, and maintained properly, DPFs are a reliable and effective technology to reduce diesel PM emissions from stationary emergency standby engines. Furthermore, during the latest amendment to the Stationary Diesel Engine ATCM, CARB concluded that "applications of DPFs on emergency standby engines are technically feasible and there are currently about 300 emergency standby engines in California that have DPFs installed."

9. Comment: The commenter supports the reduction of diesel PM, but emphasizes the need to weigh the small reductions of PM from PAR1470 against the increased risks of failure of engines used to provide power during emergencies.

Response: Please refer to Response to Comment # 8. Use of a diesel particulate filter will reduce PM by more than 85 percent. This is a substantial emission reduction in PM, particularly diesel PM. Based on health risk data from CARB, a new emergency standby engine can pose a substantial health risk depending on its proximity to receptors. The proposed amendments are designed to ensure that new emergency engines do not pose a substantial health risk. Under the proposed amended rule, new emergency standby engines within 100 meters of a sensitive receptor will be required to meet Tier 4 PM emission limits. This will reduce the diesel PM and health risk by about 85 percent below Tier 3 PM emission levels. This ensures that the most vulnerable population is protected.

10. Comment: The DPF failures being discovered suggest that passive filters are not the most viable solution for emergency engines. If actively-regenerated DPFs are a preferred solution, the number of vendors offering viable products become further restricted. If SCAQMD prematurely mandates the widespread use of PM filters on emergency engines, the District may inadvertently remove any practical choice between vendors until more actively-regenerated products are verified and available in the market.

and

Passively-regenerated PM filters rely upon an adequate level of NOx to PM in order to function properly. Several filter vendors generally require a minimum NOx:PM ratio between 20:1 to 25:1, however, many engines under 600 bhp

have NOx:PM ratios below these minimum standards, with some as low as 12:1. Passive filters may not be feasible for use with these engines, so operators of these engines would be forced into the additional cost and restricted vendor choice of actively-regenerated filters. T-BACT determinations for engines with low NOx:PM ratios should not require the use of PM filters.

Response: CARB currently has 11 Level 3 VDECs for stationary emergency standby diesel engine applications. Of the 11 verified technologies for stationary emergency standby engines, there are 10 passive systems and 1 active system. These VDECs apply to hundreds of engine families representing thousands of engine models ranging from 50 brake horsepower to 4,000 brake horsepower. Each verified DPF is required to undergo a minimum durability demonstration period of 500 hours in order to show the extended service accumulation period of the DPF after installation.

Based on review of Executive Orders for 10 passive DPFs, only one manufacturer explicitly requires a minimum NOx to PM ratio in order to function properly. This particular manufacturer requires a NOx:PM ratio of "at least 8 with a preference for 20 or higher." Based on evaluation of emission certification data for several model year 2011 generator engines, many engine emission profiles meet a minimum NOx:PM ratio of 8 or greater. For instances where engine emission profiles do not meet NOx:PM ratio requirements for a particular passive DPF system, there are 9 other passive systems and one active DPF which may be selected as alternatives.

11. Comment: After-treatment controls, such as DPFs, negatively affect the reliability of diesel engines and increase the chances of engine failure during a power failure or emergency, because DPFs rely on the operator to perform additional maintenance to ensure proper operation and regeneration. SCAQMD maintains that any such failures can be avoided by proper maintenance of the filter system such as running the engine longer, load banks, or periodic DPF cleaning and change out. Although constant maintenance and adding load banks to assure proper temperature is reached for regeneration is possible, such human-controlled factors introduce additional failure modes and reduce the reliability needed for life-safety systems. Probability for failure of emergency backup engines needs to be minimized. If the DPF causes engines to fail to start or operate and human lives are lost as a consequence, there will be little defense for the rule by claiming that better maintenance of the SCAQMD-mandated system that caused the failure was needed.

and

It appears that if problems with DPF installations are identified, SCAQMD will assign responsibility to the owner and operator for improper maintenance.

Response: SCAQMD staff recognizes that DPFs require ongoing diligence and maintenance on the part of the owner/operator, in order to remain in good operating condition. Proposed amendments to Rule 1470 require certain new emergency standby engines to meet PM emission limits achievable through the use of after-treatment technologies such as CARB Verified DPFs. Each verified DPF is issued a CARB Executive Order which provides detailed specifications for installation, maintenance, and operation of the DPF. In addition, when issuing stationary emergency engine permits, SCAQMD staff typically includes diesel particulate filter operation and maintenance requirements in permit conditions to ensure filters are properly operated and maintained. As with any SCAQMD-permitted equipment, it is the responsibility of the equipment owner and/or operator to ensure the equipment is maintained and operated in accordance with manufacturer's guidelines, SCAQMD permit conditions, and any other applicable regulatory requirements throughout the useful life of the equipment.

PAR 1470 includes provisions that would allow engine owners/operators to demonstrate compliance with the 0.01 g/bhp-hr PM emission limit by utilizing a certified CI engine that emits PM at a rate of 0.15 g/bhp-hr or less in combination with a CARB Level 3 Verified Diesel Emission Control Strategy, or an alternative diesel PM control strategy that is equally or more effective (i.e., 85% or greater PM control efficiency) than a Level 3 VDECS. During the air quality permitting process, SCAQMD staff will evaluate key parameters based on the DPF manufacturers' specifications, in order to verify the compatibility of an engine/DPF system. Key parameters to assess compatibility may include, but are not limited to: PM emission rate, engine type/description, engine exhaust temperature profile, fuel type, NOx to PM ratio (if applicable), and other requirements specified by the DPF manufacturer. Additionally, key operating parameters, such as manufacturer's recommended regeneration, cleaning, and maintenance intervals will be included in SCAQMD permit conditions to help ensure the continued performance and reliability of the DPF.

12. Comment: In several cases, the lack of new prime engines rated below 200 hp that are compatible with PM filters due to high PM emission rates or low NOx/PM ratios forced "upsizing" of engines in order to comply with permitting policies and regulations. Several of these engines were prematurely replaced due to damage caused by extended low-load operations. In one case, the only viable solution to the mismatch between engine technology and PM filters was to install multiple small engines rated below 50 hp at a single site to avoid PM filter requirements entirely.

Response: New emergency standby engines will not have issues of high PM emission rates. Since the adoption of Rule 1470 in 2004, all new emergency engines have been required to meet a PM emission rate of 0.15 g/bhp-hr. (Facilities near schools have been required to meet an emission rate of 0.01 g/bhp-hr PM).

Based on SCAQMD's permit database there have been no issues with the availability of new emergency standby engines that can achieve a PM emission rate of 0.15 g/bhp-hr. Under CARB's verification of diesel particulate filters, the Executive Orders stipulate the maximum PM emission rate that is allowed for the diesel particulate filter. According to the Executive Orders for CARB verified diesel particulate filters the lowest PM emission rate required is 0.15 g/bhp-hr, and most are at 0.2 g/bhp-hr. Thus, PM emission rates of new emergency standby engines are not anticipated to hinder the application of diesel particulate filters on new engines. As discussed in response to comment #7, there are several options available to prevent low load engine operation, including the use of temporary or permanently installed load banks to apply continuous loads to generator sets during normal operation. Further, as discussed in response to comment #29, industry guidance suggests that diesel engines should avoid prolonged periods of low load operation, in order to prevent engine damage associated with issues such as "wet stacking."

13. Comment: Stationary diesel engines are selected based on the specific needs and applications of the end user, and DPFs should be adapted to accommodate the operating parameters of the engines. However, SCAQMD's proposed requirements force engines to be selected and adapted to accommodate the operating parameter requirements of DPFs.

Response: Review of CARB Verification data has identified a variety of different DPFs available for different engine families. Additionally, PAR 1470 includes provisions that would allow engine owners/operators to demonstrate compliance with the 0.01 g/bhp-hr PM emission limit by utilizing a certified CI engine that emits PM at a rate of 0.15 g/bhp-hr or less in combination with a CARB Level 3 Verified Diesel Emission Control Strategy, or an alternative diesel PM control strategy that is equally or more effective (i.e., 85% or greater PM control efficiency) than a Level 3 VDECS. PAR 1470 does not require a specific control technology to achieve the stated emission standards. While DPFs are the likely technology for meeting Tier 4 Final PM emission limits, there are a variety of emission control options available for engines subject to the PAR 1470 health risk threshold requirements (i.e., located more than 100 meters from a sensitive receptor).

14. Comment: Emergency engines equipped with DPFs may need more than 50 hours of operation per year for maintenance and testing, due to the increased operating time needed in order to properly maintain/regenerate DPFs.

Response: Based on review of various DPF manufacturers' requirements for filter regeneration, it appears that 50 hours of operation for annual maintenance and testing is adequate for emergency standby engines. For example, an emergency generator engine with a DPF that is operated on a weekly basis for maintenance and testing at 30 minutes per test, could potentially be required to perform

regeneration up to 5 times per year (based on the lowest number of cold starts and 30 minute idle sessions allowable prior to required regeneration according to filter regeneration requirements in CARB Verification documents). CARB Verification information indicates that the longest required time to regenerate a filter would be 2 hours per regeneration event. Based on CARB Verification information, the maximum number of regeneration events required in this example would be 5 per year, at 2 hours per regeneration event (52 weeks per year/ 10 cold starts before regeneration required, results in 5 regeneration events required per year). This sample operating schedule would result in a total of 36 hours of operation (26 hours for routine maintenance and testing + 10 hours for filter regeneration), which is well below the allowable annual limit of 50 hours for maintenance and testing. Despite the increased operating hours needed for filter regeneration, there is still a reduction in health risk relative to an uncontrolled engine emitting 0.15 g/bhp-hr PM.

15. Comment: Under the proposed requirements, new emergency standby engines would be required to run for 24-hours (with additional cost of $10,000 in fuel and $2,000-$5,000 for rental of a load bank) and potentially rent a generator for backup during testing, in order to comply with CARB's DPF installation and data logging requirements.

Response: SCAQMD staff understands that the CARB Verification Procedure includes a Pre-installation Compatibility Assessment provision. The purpose of this provision is to ensure that the engine is compatible with the diesel particulate filter. Included is a provision that requires that the exhaust gas temperature of the candidate engine be measured and recorded for a period that is long enough to determine the exhaust gas temperature profile associated with the candidate engine's duty cycle, but not less than 24 hours of representative, actual engine run time.

Based on communications with CARB staff, this provision was not intended for stationary emergency back-up engines. CARB staff acknowledges that the exhaust gas temperature profile for stationary emergency back-up engines can be achieved within 1 hour. CARB staff is working on amending the Verification Procedures and intends to address this issue by carving out a specific provision for stationary emergency back-up engines that would allow air districts to establish the appropriate time period to conduct the pre-installation compatibility assessment.

16. Comment: Operators are just now learning of the technology limitations (and sometimes failures) of PM filters that were installed years ago, due to the limited operating schedules of emergency engines. Failures that have been witnessed have occurred after expiration of performance warranties and after minimal emission reductions.

In addition, the SCAQMD should solicit guidance from engine distributors and engine service providers in order to obtain accurate and reliable information regarding experiences with DPFs currently in use on emergency standby engines. Local dealers fear that DPF reliability issues have been limited only due to the fact that engines with DPFs have not operated for many hours or at loaded conditions. The implications of widespread DPF use on emergency engines will not be fully understood until the existing engines with DPFs have accumulated more operating hours. In other cases, engine operators may be unaware of past or potential problems because they are not exposed to the true nature of many operating problems.

Response: SCAQMD permitting data indicates that diesel particulate filters have been installed and operated with stationary emergency standby engines in the District since 2004. As discussed in the response to comment #8, SCAQMD staff consulted engine manufacturers, engine dealers, DPF manufacturers, engine/DPF service providers, and engine/DPF end users to evaluate the performance history of DPFs used on emergency standby engines in the District. Very few engine failures resulting from DPF use have been identified to date, and those issues identified have been mitigated through implementation of proper maintenance and operation procedures, or were found to be the result of the improper installation of a DPF on an incompatible engine (i.e., engine PM emission rate was too high for the DPF). As stated in the response to comment #7, SCAQMD staff believes DPFs are reliable, effective means of reducing diesel PM emissions from stationary emergency engines, provided they are installed, operated, and maintained in accordance with manufacturer's guidelines.

Emissions testing of DECs are required to be performed on an emission control group under specific engine testing conditions including parameters for test cycles and runs. For stationary emergency standby engines, a minimum durability demonstration period of 500 hours is required to show the extended service accumulation period of the DECs after installation. Exhaust temperature, engine backpressure, and engine speed are also required to be measured and recorded during the entire durability testing period. DECs must ultimately demonstrate compatibility in the field with at least one piece of equipment belonging to the initial emission control group for which it seeks verification.

It should be noted that, pursuant to the CARB Verification Procedure, each verified DPF is covered under manufacturer warranty to be free from defects in design, materials, workmanship, or operation of the diesel emission control strategy which cause the diesel emission control strategy to fail to conform to the emission control performance level it was verified to, for a period of 3-5 years (or 1600- 4200 operating hours) depending on the associated engine's size. As required by the Verification Procedure, the product warranty must

cover the repair or replacement cost of the diesel emission control strategy and the full repair or replacement cost of returning engine components to the condition they were in prior to the failure, for damage to the engine proximately caused by the emission control strategy. Warranty coverage may be excluded if the diesel emission control strategy or engine has been abused, neglected, or improperly maintained, and that such abuse, neglect, or improper maintenance was the direct cause of the need for the repair or replacement of the part. Additionally, the installer of the verified DPF is required to warrant that the installation is free from defects in workmanship or materials which cause the diesel emission control strategy to fail to conform to the emission control performance level it was verified to, for a period of 3-5 years (or 1600-4200 operating hours) depending on the associated engine's size.

Control Equipment Costs Compared to Risk and Emission Reductions

17. Comment: Costs of many DPF installations exceeded $250,000 - $350,000 per engine, representing normalized costs between $98 and $142 per engine hp. Minimum costs of installing DPFs in new facility installations is approximately $60/bhp (direct capital costs only, not including indirect costs incurred at time of installation or increased operating costs).

Response: The equipment and installation costs for diesel particulate filters are included in Chapter 1 of this report. DPF equipment costs vary, depending on several factors such as the engine size, DPF manufacturer, and engine/DPF dealer/installer. Installation costs can vary considerably from one project to another, depending on a wide range of variables including, but not limited to: active vs. passive DPF, typical engine duty cycle and operating characteristics (i.e., engine loads and exhaust temperatures), accessible space for the new equipment, availability of existing facilities/equipment, exhaust ventilation needs, and building code/fire safety requirements. SCAQMD staff compiled a broad collection of cost data for DPF equipment and will present this information in the Draft Staff Report for consideration by the Governing Board in their evaluation of the proposed amendments.

18. Comment: After-treatment with SCR and DPFs can be effective for reducing emissions from diesel engines when operating conditions meet specifications that allow the after-treatment devices to function properly. However, in addition to being technically feasible, the addition of the devices must also be economically feasible and cost effective. Both US EPA and ARB have examined the cost-effectiveness of adding after-treatment devices to emergency diesel engines and came to the conclusion that SCR and DPF systems cannot be justified for use on emergency engines. ARB's analysis reported that the cost to retrofit emergency engines with DPFs increased by anywhere from $19,000 to $141,000 and, because of the limited hours of operation, the cost effectiveness for reduction of PM by adding a DPF was estimated to be between $530 and

$550 per pound, or $1,100,000 per ton of PM reduced. This was 3 to 42 times more expensive than other ARB rulemaking.

It appears that CARB's estimates of costs to control emergency engine PM emissions may actually be understated, for the following reasons:

- A recent survey of dealer-supported transactions shows that installed PM filter costs are approximately $55 per hp, compared to CARB's estimate of $38 per hp. These costs reflect a premium of 60-70% over the cost of a new engine. Costs of actively regenerated filters can reflect a cost premium of 80% over the cost of a new engine, when architectural modifications may be needed to accommodate the filter or when enhanced sound attenuation is required to meet local codes. Operators would be faced with PM control costs in excess of $1,000 per pound of PM controlled, and in some cases in excess of $1,500 per pound of PM. These costs are 10 to 100 times higher than the costs borne by other sources of diesel PM.
- CARB assumed that uncontrolled engines were operated for 22 hours for annual testing and maintenance, and 7 hours per year for emergency use. CARB also assumed the installation of a PM filter would result in only two additional operating hours per year for testing and maintenance. It is possible that many operators have reduced testing and maintenance hours to levels below 22 hours per year, and emergency use hours may be lower than 7 hours per year. Further, operation of engines equipped with PM filters may generally increase by more than two hours per year.
- CARB assumed that filters would be installed on Tier 2/3 engines certified to meet 0.15 g/bhp-hr PM, but they may not have adequately considered the emissions profile of Tier 2/3 engines. Many certified stationary emergency engines actually emit PM at rates less than 0.1 g/bhp-hr. For example, many Tier 2 engines rated above 750 hp are certified at emission rates between 0.05 and 0.07 g/bhp-hr.

Response: SCAQMD staff agrees with CARB's assessment that after-treatment technologies for NOx, specifically selective catalytic reduction, are not suited for emergency standby engines because their normal testing sessions of 15 to 30 minutes do not allow sufficient time for the catalyst to reach temperatures needed to properly operate.

Proposed Amended Rule 1470 will retain Tier 4 particulate emission standards for new stationary emergency standby engines, but narrows the applicability of PM emission requirements for new emergency engines. Diesel particulate filters are a technologically feasible PM control strategy for stationary emergency standby engines. Through their Verified Diesel Emission Control Strategy program, CARB has verified 11 diesel particulate filters for stationary emergency standby generator engines. PAR1470 requirements for PM after-treatment controls are aimed at protecting public health from impacts from diesel particulate matter emissions, and are focused on minimizing health

impacts from engines located at or near sensitive receptors, such as schools, residences, and health care facilities. Additionally, proposed amendments intend to limit harmful PM emissions from these engines which can often remain in service at a fixed location for more than 20 years.

Analysis of costs associated with implementation of Rule 1470 were presented to the Board when Rule 1470 was originally adopted in 2004. SCAQMD staff has updated after-treatment control equipment costs in this report, which include installation costs. It should be noted that equipment and installation costs can vary considerably from one project to another, depending on a wide range of variables. Estimated costs presented in this report were compiled from engine/DPF manufacturers and dealers, sample project costs provided by stakeholders, and calculated costs based on the EPA Alternative Control Techniques Document: Stationary Diesel Engines (March 2010). Updated cost information will be presented in the Draft Staff Report for consideration by the Governing Board in their review of the proposed amendments.

19. Comment: The cost of PM after-treatment controls is excessive and presents a disincentive for owners to replace old, high PM-emitting engines. For example, a new Tier 3 engine would cost approximately $52,000. However, after-treatment controls (DPF) and a permanently installed load bank would cost a total of $62,000, doubling the cost of the new equipment.

Response: The costs associated with diesel particulate filter use on stationary engines are provided in Chapter 1 of this report. It should be noted that existing Rule 1470 currently requires the installation of diesel particulate filters, and the proposed amendment narrows the scope of that requirement. As a result, PAR 1470 requirements for PM controls are already required by the existing rule. In addition, PAR 1470 has no requirements that dictate when engines must be replaced, so timing of replacements is at the discretion of the facility. Further, there are a number of factors that affect business decisions regarding equipment replacement, in addition to cost such as upgrades or other modifications, including whether or not the equipment is at the end of its useful life; economic factors; equipment breakdowns; etc.

The proposed amendments represent a pollution prevention measure which has been implemented on stationary emergency standby engines in the District and throughout the state since as early as 2004. Emergency engines typically have a longer useful life than other engines due to their low hours of operation. However, even with their low hours of operation, these engines may still pose a substantial health risk to nearby receptors.

Availability of CARB-Verified DPFs

20. Comment: There is very limited availability of CARB-Verified DPFs for use with 2011 model year engines. Currently, there are only 3 DPF manufacturers with products verified for model year 2011 engines. Additionally, CARB-verified DPFs cannot be used with engines equipped with EGR (prohibited by current Executive Orders). Many newer engines use EGR to control NOx emissions, therefore many new engines will not be eligible for retrofit with a verified DPF. Engine owners need other PM control options if CARB-Verified products are not available for their specific engines.

and

We recommend adding a condition requiring a VDECs be installed within one year when one becomes available.

Response: Currently, CARB's Executive Orders for stationary engine VDECs indicate that "the engine must be certified to meet the ARB off-road engine standards for compression ignition engines.". Since stationary diesel engines are exempt from the California Off-Road Standards (including engine certification requirements), all new stationary diesel-fueled engines will only be certified to federal NSPS emission standards.

The federal NSPS standards do not require NOx or PM after treatment for new emergency standby engines. Under the federal NSPS, new emergency standby engines will be required to meet latest Tier 2, 3, or 4i (depending on the engine size) emission standards which do not require exhaust after-treatment controls. As a result, most engine manufacturers are currently certifying emergency standby engines to the federal EPA/NSPS standards. SCAQMD staff has contacted DPF manufacturers who indicate that their engine compatibility specifications have not changed. Federal engine certification standards do not require further future emission reductions beyond the non-after-treatment based Tier 2, 3, or 4i limits for new emergency standby engines. Therefore, it is not anticipated that certified Tier 2, 3, or 4i engines (without after-treatment) will undergo major modifications such that they will no longer be compatible with currently available DPFs.

PAR 1470 includes provisions that would allow engine owners/operators to demonstrate compliance with a 0.01 g/bhp-hr PM emission limit by utilizing a certified CI engine that emits PM at a rate of 0.15 g/bhp-hr or less in combination with a CARB Level 3 Verified Diesel Emission Control Strategy, or an alternative diesel PM control strategy that is equally or more effective (i.e., 85% or greater PM control efficiency) than a Level 3 VDECS. Additionally, compliance may be demonstrated through the use of a Tier 4 certified CI engine that emits PM at a rate of 0.01 g/bhp-hr or less.

21. Comment: We believe that passively regenerating DPFs are not feasible for our emergency engines. Active systems would be most appropriate, however, there is only one vendor supplying CARB-verified active DPFs for use with stationary emergency standby engines.

Response: Passive DPFs are technologically feasible for emergency standby engines. Regeneration is the process of removing the accumulated soot from the filter. DPFs that passively regenerate rely on the available exhaust heat to burn the accumulated soot from the filter. Most DPF manufacturers recommend that operators regenerate passive DPFs after a specified number of idle sessions, cold starts, and/or operating hours.

Based on information provided by DPF manufacturers, many engines may achieve exhaust temperatures suitable for passive regeneration at engine loads of approximately 30 percent. Some engines are capable of achieving exhaust temperatures suitable for passive regeneration at engine loads as low as 10 percent . There are situations, however, where the engine may be substantially oversized for the application and the typical engine loads are so low that the minimum exhaust temperature to regenerate the filter is not reached. In these situations, passive DPFs are still feasible provided the operator uses a load bank to increase the load on the engine and to ensure the engine can achieve exhaust temperatures suitable for passive regeneration during emergency operations.

22. Comment: If a facility purchases a new emergency standby engine, but there is no CARB-verified DPF available for that engine, and the facility is unable to demonstrate compliance with Rule 1401(d)(1)(A) due to their operating hour requirements, will the SCAQMD be able issue a Permit to Construct/Operate to the new engine owner?

Response: The selection of the engine and the control device should be made together to ensure the engine is compatible with the diesel particulate filter. Proposed Amended Rule 1470 includes a provision that allows the operator to use an alternative diesel PM control method that is equally or more effective than a Level 3 Verified Diesel Emission Control Strategy. During the air quality permitting process, SCAQMD staff will evaluate key parameters based on the DPF manufacturers' specifications, in order to verify the compatibility of an engine/DPF system. Key parameters to assess compatibility may include, but are not limited to: PM emission rate, engine type/description, engine exhaust temperature profile, fuel type, NOx to PM ratio (if applicable), and other requirements specified by the DPF manufacturer. Additionally, key operating parameters, such as manufacturer's recommended regeneration, cleaning, and maintenance intervals will be included in SCAQMD permit conditions to help ensure the continued performance and reliability of the DPF

The owner or operator will need to comply with applicable emissions or health risk requirements of Proposed Amended Rule 1470 before a permit can be issued for a new emergency standby engine. There are several compliance options to meet the risk requirements under Rule 1401(d)(1)(A). The health risk provision allows more flexibility than meeting the specified emission rate. Engines that must meet the Rule 1401 (d)(1)(A) risk requirements are located than 100 meters from a sensitive receptor. Since the health risk drops off considerably after 100 meters, the level of control needed to meet the risk requirements under Rule 1401 (d)(1)(A) will vary for each engine. In some cases, no further controls will be needed. For those engines that will need to reduce diesel PM emissions there are a variety of options. One option is to meet the specified emission rate using a pollution control device such as a diesel particulate filter. It is likely that other pollution control options such as use of a diesel oxidation catalyst may also meet the Rule 1401(d)(1)(A) health risk. Other compliance paths are reducing the hours of testing and maintenance hours or possibly distancing the engine from receptors. In addition, it may also be feasible that a "Tier 2 or 3 engine" whose emissions are certified below the 0.15 g/bhp-hr standard can achieve the Rule 1401(d)(1)(A) health risk.

Water and Sanitation District Concerns

23. Comment: Water and sanitation districts need reliable backup or redundant systems during emergencies, and believe that dependable diesel engines (without diesel PM filters) can provide these redundant systems. Water and sanitation districts believe that engines equipped with DPFs may fail or may not be available during emergencies because DPFs are not reliable or may not have been regenerated as required.

Response: As stated in response to comment #7, SCAQMD staff believes that CARB VDECs applications on stationary emergency standby engines are a reliable and effective technology to reduce PM emissions, provided they are installed, operated, and maintained in accordance with manufacturer's specifications. However, available emission control options may be limited for water and/or sanitation districts in cases where sewage and/or water pumps are located at unmanned sites, where personnel are not readily available to respond to engine or DPF related equipment issues. To address these concerns, clause (c)(2)(D)(iii) has been added to PAR 1470, which contains the emission limits and hours of operation requirements for new stationary emergency standby engines used to supply power to electrically-driven flood control pumps. These engines would be subject to a PM emission limit of 0.15 g/bhp-hr and NMHC+NOx and CO standards comparable to those for other emergency standby engines, provided the engines are located more than 50 meters from a sensitive receptor (except schools), are not typically occupied by employees of the engine owner/operator, and are operated no more than 20 hours per year for maintenance and testing.

24. Comment: Sewage pumps are often oversized to accommodate worst case sewage flows, resulting in emergency engines operating at low loads during "typical" emergency use. We believe that load banks may be used to increase generator/engine load during routine testing, however, during emergency use, sewage pump engines will run at low loads which will not produce the exhaust temperatures needed for passive DPF regeneration

Response: As stated in response to comment #10, there are a variety of DPFs available which can accommodate a wide range of engine sizes and engine exhaust temperatures. Please also refer to response to comment #7, which discusses the availability of several options for emergency standby engines which may typically operate at low loads and/or engine exhaust temperatures. However, available emission control options may be limited for water and/or sanitation districts in cases where sewage and/or water pumps are located at unmanned sites, where personnel are not readily available to respond to engine or DPF related equipment issues. To address these concerns, clause (c)(2)(D)(iii) has been added to PAR 1470, which contains the emission limits and hours of operation requirements for new stationary emergency standby engines used to supply power to electrically-driven flood control pumps. These engines would be subject to a PM emission limit of 0.15 g/bhp-hr and NMHC+NOx and CO standards comparable to those for other emergency standby engines, provided the engines are located more than 50 meters from a sensitive receptor (except schools), are not typically occupied by employees of the engine owner/operator, and are operated no more than 20 hours per year for maintenance and testing.

25. Comment: We are concerned about environmental impacts from sewage spills resulting from failure of emergency generator engines equipped with DPFs. Emergency engine failure, caused by a plugged DPF at sewage treatment plants may expose employees and the public to raw sewage overflows.

Response: Proper use and maintenance of a diesel particulate filter will ensure that the diesel particulate filter does not plug or otherwise malfunction. Facilities that elect to comply with Proposed Amended Rule 1470 by installing a diesel particulate filter will be required to comply with maintenance requirements specified in their SCAQMD Permit to Operate to ensure the diesel particulate filter is appropriately regenerated, cleaned, and replaced if applicable. In addition, under Rule 1470 all DPFs are required to be installed with a backpressure monitor to notify the owner or operator when the high backpressure limit of the engine is approached.

26. Comment: Water Districts are concerned that the public will not have access to potable water in an emergency if their diesel engines (equipped with DPFs) fail.

and

Agencies with responsibilities to supply potable, firewater, and sewage treatment should be exempted from Rule 1470 requirements for diesel PM after-treatment controls.

Response: As stated in Response to Comment #7, when installed, operated, and maintained properly, diesel particulate filters are reliable and effective means of controlling PM emissions from stationary engines. However, available emission control options may be limited for water and/or sanitation districts in cases where sewage and/or water pumps are located at unmanned sites, where personnel are not readily available to respond to engine or DPF related equipment issues. To address these concerns, clause (c)(2)(D)(iii) has been added to PAR 1470, which contains the emission limits and hours of operation requirements for new stationary emergency standby engines used to supply power to electrically-driven flood control pumps. These engines would be subject to a PM emission limit of 0.15 g/bhp-hr and NMHC+NOx and CO standards comparable to those for other emergency standby engines, provided the engines are located more than 50 meters from a sensitive receptor (except schools), are not typically occupied by employees of the engine owner/operator, and are operated no more than 20 hours per year for maintenance and testing.

27. Comment: Water and Sanitation District concerns were not properly characterized in the Draft Subsequent Environmental Assessment document- most water and sanitation districts do not use direct-drive flood control pumps. Most engines of concern are electric pumps with emergency standby generators for backup power supply

Response: The Draft Subsequent Environmental Assessment document has been revised to properly characterize Water and Sanitation District concerns regarding the use of electric flood control pumps with emergency standby generators.

Healthcare Industry Concerns

28. Comment: Healthcare facility operators are concerned about the potential failure of emergency generators during a power outage, which would prohibit essential services from being operational and paralyze its life-supporting systems. Emergency generators are only used for emergencies. Hospitals are not willing to accept risk of engine failure during an emergency, since power loss during an emergency could place patient lives at risk.

and

DPF operating problems may currently be isolated because most engines configured for emergency operation have not been run for extended periods of time or under adequate load conditions. This is particularly relevant in the healthcare sector because generators are usually over-sized from risk prevention and management perspectives.

Response: SCAQMD staff recognizes the need for healthcare facilities to keep their emergency generators operating during emergencies and has worked with the hospital association to identify potential options for compliance with proposed amendments. Based on the SCAQMD survey of facilities with DPFs and input from the Rule 1470 Working Group meetings on May 12, 2011 and June 9, 2011 there were seven issues with DPFs as discussed in the Draft Staff Report. The most significant issue occurred at a hospital and was due to improperly retrofitting an old marine engine with a DPF and failure to regenerate the DPF. In this specific situation, the PM emission rate from the engine was approximately 3 times the level that the DPF was designed for. The engine's high PM emission rate, coupled with a lack of proper maintenance led to DPF failure and resultant engine damage.

Proposed Amended Rule 1470 requirements do not allow new emergency standby engines to emit diesel PM at a rate that exceeds 0.15 g/bhp-hr and all currently Verified DPFs are designed to operate properly at or below that emission level. In addition, if a DPF is installed, the facility will be required to comply with the DPF manufacturer's operating and maintenance requirements to ensure that the DPF is properly maintained. As stated in Response to Comment #7, regeneration of a passive DPF on an emergency generator can be accomplished with the use of a load bank if typical operation does not produce sufficient load/exhaust temperatures for regeneration. Alternatively, an active DPF can be utilized, which is capable of regenerating the filter using an external heat source rather than relying on available engine exhaust heat. Therefore, it is anticipated that new emergency standby engines equipped with compatible DPFs which are properly installed and maintained will operate as needed during emergencies.

29. Comment: Hospitals typically oversize emergency generators to operate at 20-30% during an emergency and are concerned that DPFs are not feasible for these applications. DPF filter regeneration may not be reasonably maintained based on the curtailed maintenance and testing time of emergency engines. Even with diligent maintenance supervision, PM filters may still become clogged, resulting in excessive engine backpressure and ultimately leading to engine failure. If such an event were to occur during an emergency power failure when the engine was meant to provide back-up power, it could put the lives of many patients in healthcare facilities at risk.

Response: There are a number of articles and technical recommendations that discourage continued low load engine operation. Light loading creates a condition termed *wet stacking*, indicated by the presence of unburned fuel or carbon, or both in the exhaust system. This condition is often indicated by the presence of continuous black smoke during engine-run operation. In an article by a California-based Caterpillar dealer/distributor, titled, "Averting Common

Causes of Generator Failure: Understanding How to Properly Maintain Your Standby Power System" it is recommended that "Generators should be exercised monthly at 30% of the nameplate rating or loaded to the minimum engine exhaust temperature recommended by the engine manufacturer." In a separate paper by Cummins Power Generation titled, "Maintenance is one Key to Diesel Generator Set Reliability" it also recommends to "exercise the generator set at least once per month for a minimum of 30 minutes loaded to no less than one-third of the nameplate rating."

Based on recommendations from the National Fire Protection Association and engine manufacturers, emergency generators should be tested at loads of at least 30 percent. At a 30 percent load, most engines are capable of achieving exhaust temperatures suitable for passive regeneration. Similarly during an emergency, if the engine is achieving loads of approximately 30 percent, exhaust temperatures are anticipated to reach levels needed for passive filter regeneration for most engines. Alternatively, if the engine is significantly oversized a permanently installed load bank could be utilized to supplement the load on the engine during an emergency.

30. Comment: The potential risks associated with the installation of PM filters on new emergency engines at healthcare facilities far outweighs the positive air quality impact of the proposed Rule 1470 amendments. We are concerned that SCAQMD is proceeding with the mandatory enforcement of PM filter installation until stakeholders can furnish well-documented and chronicled evidence of DPF failure. This is unacceptable when it comes to risk prevention in needed healthcare facilities. Healthcare facilities will bear increased liability for any loss of life or injury caused by a PM filter failure during an emergency power outage and a healthcare facility cannot provide the necessary life-saving services to its patients.

and

Healthcare facilities should be exempted from the mandatory installation of PM filters on new emergency engines until there are assurances that DPF failures and resultant engine damage/failure will not place patients at risk.

Response: SCAQMD staff has asked for documentation of DPF related issues throughout the rule development process and has worked with stakeholders to address any issues identified. The SCAQMD survey of facilities using engines with DPFs indicated that most users reported no problems and investigation of all identified issues indicated that they had been resolved as stated in the response to Comment # 8. Based on SCAQMD research and examples presented during rule development, an exemption for health care facilities does not appear to be warranted. Please refer to Chapter 1 of the Draft Staff Report for a discussion of "Facilities in the Basin using DPF's on Emergency Standby Engines."

31. Comment: Space availability, seismic load standards, existing building load bearing capabilities, sound attenuation requirements, engine backpressure restrictions, and other architectural/engineering restrictions may inhibit or prevent the ability to utilize a PM filter in both existing facilities and facilities that are being constructed. In cases where these restrictions make the installation of a PM filter excessively expensive or infeasible, a certified stationary emergency engine (emitting 0.15 g/bhp-hr PM or less) should be considered T-BACT. and

Additional time will be added to the engineering design process for the installation of a PM filter, which could complicate the emergency power response for many hospitals. Additionally, seismic management issues with the installation of PM filters pose a potentially serious risk should a catastrophic event disable the PM filter and restrict operation of the engine during an emergency situation.

Response: DPF installation will only be required for new emergency standby engines. Installation of new emergency standby engines requires engineering which takes into consideration all of the criteria listed. SCAQMD staff recognizes that additional time and expense may be required for the addition of DPFs as of the preparation for purchase and installation of new emergency standby engines. Analysis of the costs associated with the installation of DPFs is included in the staff report. Please see the Response to Comment # 7 regarding the proper sizing, installation, and maintenance of DPFs. In addition, the SCAQMD survey of facilities with DPFs on their emergency standby engines included three health care facilities and these facilities reported no issues with their DPFs. As stated in the Response to Comment # 28, only one issue was identified with a hospital installation, which was determined to be the result of an incompatible DPF installation and improper engine/DPF maintenance.

Requested Revisions to PAR1470 Rule Language

32. Comment: Rule language should be revised to replace "CARB Verified Diesel Particulate Filter" with "Verified Diesel Emission Control Strategy". Diesel particulate filters would be included under "Verified Diesel Emission Control Strategy"

Response: Proposed amended rule language in section (f)(6) has been revised to allow owners/operators to demonstrate compliance with the 0.01 g/bhp-hr PM emission limit by using a certified engine that meets a 0.15 g/bhp-hr PM limit in combination with a "CARB Level 3 Verified Diesel Emission Control System," which would include diesel particulate filters capable of achieving at least 85% reductions of diesel PM emissions.

33. Comment: PAR1470 should include language allowing any new engine (particularly engines located <100 m from a sensitive receptor) to forego Tier 4 PM

requirements if a risk assessment demonstrates cancer risk less than one in one million.

Response: Proposed amendments requiring new emergency engine compliance with Tier 4 PM limits are intended as pollution prevention and health protective measures. Proposed Amended Rule 1470 narrows the requirements to achieve Tier 4 PM requirements to those engines that are located near the most sensitive populations and engines unable to demonstrate cancer risk of less than one in one million to the nearest receptor. Based on available diesel engine risk assessment data, cancer risk from diesel PM emissions declines considerably when receptors are located more than 100 meters from a stationary diesel engine. The commenter can present this approach to the Governing Board at the Hearing for Proposed Amended Rule 1470.

34. Comment: PAR1470 should allow accommodations for engine replacements, where health risk would be greatly reduced if an existing engine is replaced with a new, less-polluting and uncontrolled engine. PAR1470 should include provisions to exclude engine replacement projects from proposed risk requirements

Response: Current Rule 1470 would require the use of DPFs to meet Tier 4 emission standards for diesel PM and PAR 1470 reduces the scope of that requirement to protect the health of sensitive receptors. PAR 1470 has no requirements that dictate when engines must be replaced, so timing of the replacements is at the discretion of the facility. When engines are replaced, they will be subject to the PM emission standards applicable at the time of replacement. Exempting replacement of an engine from these requirements would result in smaller reductions in health risk over the useful life of the engine which may be 20 or more years. Therefore, an exemption was not deemed warranted.

35. Comment: Staff should revise the PAR1470 definition of "sensitive receptor." The proposed definition is too broad and should exclude residences, private homes, apartments, dormitories, and prisons. The definition should include only those receptor locations with people sensitive to toxics and criteria pollutants, such as hospitals, schools, convalescent homes, hospices, and other similar locations

Response: The definition of sensitive receptor is consistent with the definitions in Rule 1420.1 and Rule 1469 and extends the health protective intent of the proposed amendments. The proposed definition includes residences because children, the elderly, and other health-compromised individuals are often located in residences.

36. Comment: Please add a PM emission limit table to section (c)(2)(C)(iii)(II)

Response: The PAR 1470 limits for PM are located in the state Off-Road Compression Ignition Engine Standards (Off-Road Standards; Title 13, California Code of

Regulations, Section 2423) which consist of increasingly stringent emission levels phased in over several years based on the horsepower rating of the engine. The proposed amendments would require certain new engines to meet Tier 4 Interim PM emission levels of 0.01 to 0.075 g/bhp-hr, depending on the engine size, beginning in 2012. By 2015, all new emergency standby engines subject to PM control requirements must meet the Tier 4 Final emission limits of 0.01- 0.02 g/bhp-hr (depending on engine size), which would require after-treatment for diesel PM. A table has been provided in the Draft Staff Report for reference.

37. Comment: Revise rule language in section (c)(2)(C), to include "date of application" instead of the current "date of installation". It is infeasible for facilities to complete installation of new engines prior to Jan.1, 2012 if the proposed amendments to Rule 1470 will not be presented to the Board until October 2011

Response: Rule language in PAR 1470 section (c)(2)(C) has been revised as "Any new stationary emergency standby diesel-fueled engines (>50 bhp) with a date of initial installation or with an application for Permit to Construct or Permit to Operate deemed complete on or after January 1, 2011 and prior to January 1, 2012…" This language has been revised to allow for completion of installation of new equipment after January 1, 2012, provided a complete permit application has been received and filed with the District within the January 1, 2011 to December 31, 2011 timeframe. New engines subject to this provision would be allowed to emit diesel PM at a rate of less than or equal to 0.15 g/bhp-hr.

38. Comment: Revise the heading of Table 1 in PAR1470 by replacing "," with "+" between the words "NMHC" and "NOx"

Response: The correction has been made.

Emissions

39. Comment: What is the impact of PAR1470 foregone emission reductions on SCAQMD SIP emissions?

Response: When Rule 1470 was adopted in 2004, SCAQMD staff did not take credit for emission reductions in the SIP. Therefore, this amendment will not affect the SIP.

40. Comment: The PAR 1470 impact assessment should be revised based on the number of new engines expected to be added to the Basin and new engines expected to replace existing engines. A substantial number of new engines may be replacing older engines with better fuel mileage and less emissions.

Response: The assumptions for the impact assessment present a reasonable worst case and are characterized as such. For the purposes of CEQA analysis, it was assumed that all engines were new rather than replacement engines. This is consistent with typical impact assessments for rule development.

41. Comment: SCAQMD's use of "typical" operating schedules of 20 to 30 hours per year for emergency standby engines may be slightly high for many engines in the region, and any regulatory proposals based upon these estimates may overstate the benefit of PM filter installations.

We recently surveyed a fleet of 162 stationary emergency engines located in the SCAQMD that are owned by a single entity. Results indicated that uncontrolled engines operated an average of 11.1 hours per year and emergency operating hours were less than 3 hours per year. The surveyed fleet includes 20 engines with PM filters. On average, testing and maintenance hours for controlled engines were 42% greater than the hours for uncontrolled engines. Preliminary data suggest that fuel consumption for the typical controlled engine was at least twice as high as the fuel consumption of uncontrolled engines, due to the increased operating loads required to maintain the filters. The increased operating hours and fuel consumption suggest that although PM filters may reduce emissions, they will not achieve a net emission reduction near the 85% that they are verified to achieve when the increased hours of operation are considered. The survey results also suggest that the changes in operating profiles needed to support PM filter installations will result in notable increases in NOx and GHG emissions.

and

Operating schedules for engines with PM filters requires additional hours of operation for filter regeneration, representing a 41% increase in hours and an increase in fuel usage (factor of 2.3) relative to operating hours for engines

without PM filters. Increased fuel consumption results in increased NOx and CO2 emissions and leads to increases in fuel deliveries and engine maintenance operations supported by heavy-duty diesel trucks that emit diesel PM and NOx.

Response: See response to comment #40 above regarding impact assessments for rule development. Additionally, operating hour assumptions used the maximum allowable operating hours in order to obtain the maximum "potential to emit" from new emergency standby engines. This is consistent with current SCAQMD permitting policy.

42. Comment: Installation of PM filters on emergency standby engines may result in unintended local environmental consequences, such as increased emissions of PM, NOx, and CO2 from indirect sources. Installation of PM filters typically makes the overall application of emergency generators more complex and may lead to increased mobilization of heavy equipment and heavy duty trucks at the time of installation and subsequent operating years. More frequent dispatch of heavy duty vehicles and heavy equipment to service engines and to deliver temporary load banks can lead to additional indirect emissions that offset the benefits achieved by the use of PM filters on emergency engines. In the South Coast region, it is not uncommon for a service call to require 60 miles of round trip travel. Dispatching a single service truck or equipment delivery truck in a year would result in indirect mobile source PM emissions that would negate the annual net direct benefit of a PM filter on low-use emergency engines.

Response: The comment inquires about comparing criteria pollutants and greenhouse gas emissions from secondary sources to criteria pollutant emission benefits from PAR 1470. However, Rule 1470 is a toxic air contaminant control rule to reduce health risk from stationary diesel-fueled internal combustion and other compression ignition engines. While PAR 1470 may also provide co-benefits of controlling criteria pollutants, its primary concern is to reduce health risk impacts from affected engines. The Revised Draft SEA emission and health risk analysis includes both primary and secondary pollutant sources. A summary of the analyses is also presented here:

Criteria Pollutant and GHG Emissions

Changes to the NOx and PM emission rate requirements in PAR 1470 would remove the necessity for NOx and PM after treatment on new direct-drive emergency standby fire pump engines, new direct-drive emergency standby flood control pumps, engines rated less than or equal to 50 brake horsepower, and engines used for testing or training at research or educational facilities. Changes to the NOx and PM emission rate requirements in PAR 1470 may also remove the necessity for some new emergency standby engines to install PM after treatment, if the engines are located beyond 100 meters of the nearest sensitive receptor. Any new emergency standby engines that would need to install PM after treatment would already be required to install PM after

treatment under the existing rule. Therefore, the unintended local environmental consequences listed by the commenter are a part of the existing setting under the existing Rule 1470.

During development of PAR 1470, SCAQMD staff became aware of the unintended environmental consequences identified in the comment. Since previous Rule 1470 CEQA documents did not evaluate construction related to the installation of load banks, rental of load banks, and demolition and reconstruction of support structures at facilities that replace existing emergency standby engines with new emergency standby engines; secondary adverse impacts from these activities were evaluated in the Revised Draft SEA. No credit was taken for construction or operational impacts that would not occur because NOx or PM after treatment would no longer be necessary. Construction criteria pollutant emissions from the installation of load banks and demolition and reconstruction of support structures at facilities that replace existing emergency standby engines can be found starting on page 4-4 of the Revised Draft SEA (summarized in Table 4-4). Greenhouse gas emissions from construction secondary sources are discussed on page 4-22 of the Revised Draft SEA and summarized in Table 4-17. Operational criteria pollutant emissions from the rental of load banks can be found on page 4-16 (summarized in Table 4-12). Greenhouse gas emissions from the rental of load banks are discussed on page 4-23 of the Revised Draft SEA and summarized in Table 4-18. The analysis of these secondary impacts includes use of heavy equipment and heavy-duty trucks. To provide a conservative analysis, heavy-duty trucks were assumed to travel 80 miles round trip.

Toxic Air Contaminants

Health Risk from Secondary Sources

Construction

Health risks from exposures to toxic air contaminants are localized impacts. Construction related to PAR 1470 to install load banks or for demolition and reconstruction of support structures at facilities replacing existing emergency standby engines with new emergency standby engines at any single facility is expected to last around a week or less. The primary assumption of OEHHA's guidance is that health risk from construction less than nine years in duration would be negligible. Therefore, SCAQMD staff followed OEHHA's guidance on evaluating health risks and did not quantitatively evaluate health risk from construction

Operation

The potential cancer health risk from heavy-duty truck trips related to load bank rental was estimated to be 0.029 in one million. A carcinogenic health risk of 0.029 in one million is less than the SCAQMD cancer health risk

significance threshold of 10 in one million. The health risk analysis from installation of load banks, rental of load banks, and demolition and reconstruction of support structures at facilities that replace existing emergency standby engines with new emergency standby engines can be found on page 4-20 of the Revised Draft SEA.

Health Risk from Direct Sources

Emergency standby engines without diesel particulate filters can typically achieve an emission rate of 0.15 gram per brake horsepower hour. Health risk foregone from emergency standby engines operated 50 hours a year with a emission rate of 0.15 gram per brake horsepower range from six to 11 in one million based on the CARB Engine Health Risk Screening Table for engines operated 50 hours a year at 50 percent load. The use of diesel particulate filter would reduce health risk by 85 percent. Therefore, the use of diesel particulate filters would reduce health risk from new emergency standby engines to 0.9 to 1.7 in one million.

The reduction of health risk from six to 11 in one million down to 0.9 to 1.7 in one million from the use of diesel particulate filters is between 5.1 to 9.3 in one million (6.0 – 0.9 and 11 – 1.7). This reduction in health risk would be greater than the increase in health risk (0.029 in one million) generated from indirect sources (e.g., heavy-duty diesel trucks). Therefore, increased health risk from secondary sources would not negate the annual net direct benefit of diesel particulate filters on low-use emergency engines as stated by the comment.

Other (Non-Air Quality) Environmental Impacts from Secondary Sources

Potential environmental impacts found not to be significant include secondary effects from installation of load banks and demolition and reconstruction of support structures at facilities that replace existing emergency standby engines with new emergency standby engines can be found starting on page 4-5 of the Revised Draft SEA. Secondary effects that were determined not to be significant include fuel use related to both construction and operation, noise, and solid waste from construction waste.

Conclusion

As shown above, the analysis of secondary impacts from construction related to the installation of load banks, demolition and reconstruction of support structures at facilities that replace existing emergency standby engines with new emergency standby engines, and rental of load banks in the Revised Draft EA addresses all of the concerns listed in the comment.

43. Comment: The size of our portable engine fleet would increase to accommodate the more frequent dispatch of portable engines to backup stationary engines. Our only viable option for ensuring redundant emergency backup capability may be to

install additional stationary engines at affected sites, thereby increasing fuel consumption and stationary source emissions.

Response: An emergency standby engine with a diesel particulate filter that is well maintained will be a reliable source of back-up power. If a diesel particulate filter is used to comply with Proposed Amended Rule 1470 there are a number of safeguards to ensure proper operation and maintenance of the control device. If a diesel particulate filter is used, the owner or operator will be required in the SCAQMD Permit to Operate to conduct necessary maintenance of the filter such as periodic regeneration and cleaning of the filter, if a passive filter is used. Rule 1470 currently requires that all engines with diesel particulate filters include a back pressure monitor to notify the owner or operator when the high backpressure limit of the engine is approached. These requirements along with proper engine maintenance will ensure that the emergency standby engine is a reliable source of power.

44. Comment: There is no substantial or measurable air quality benefit from the proposed rule amendment since the PM emissions from emergency engines are so low to begin with. SCAQMD's MATES III Report estimated total diesel PM emission in the basin from all sources to be 60,678 pounds per day. Of that total, only 489 pounds/day was from stationary point sources. For a 300 hp emergency engine operating on average 30 hours per year, PM reductions would be about 2.8 pounds per year or 0.008 pounds per day by adding a DPF. If 200 engines were installed with DPFs, the PM emissions reductions would be 6.6 pounds per day across the SCAQMD basin, which is a negligible fraction of the total 60,000 pound per day of diesel PM emissions (0.003 percent). Thus, implementing the proposed DPF requirement would have no measurable impact on the ambient levels of diesel PM in the basin.

Response: As a criteria pollutant, SCAQMD staff agrees that the regional benefit from requiring emergency standby engines to achieve a Tier 4 PM emission limit for new emergency standby engines is modest. As a carcinogen, however, the localized benefit can be substantial particularly for those receptors that are near the engine and in particular sensitive receptors that are more vulnerable to the health effects of diesel particulate. Based on CARB's health risk tables for diesel internal combustion engines, a single engine that operates 50 hours at a pre-controlled PM emission rate of 0.15 g/bhp-hr can produce a health risk close to ten in one million depending on the engine size, distance to receptor, engine load, and meteorological conditions. Even at 30 hours of operation at a pre-controlled PM emission rate of 0.15 g/bhp-hr the health risk would be well over one in one million and approaching five in one million depending on engine size, distance to receptor, engine load, and meteorological conditions. It should also be noted that the health risk calculations reflect operating hours for testing and maintenance and do not account for engine use during an emergency which could further increase the health risk.

SCAQMD staff believes that diesel particulate filters are technically feasible and a means to significantly reduce the exposure of diesel particulate. Emergency standby engines are located throughout the air district and are often located at sensitive receptors or near sensitive receptors. Requiring diesel emission controls for those engines that are located at or near the most vulnerable populations provides greater assurance that these sensitive populations are adequately protected.

Risk

45. Comment: The risk assessment requirements of PAR1470 will be very costly for permit applicants and we recommend the District use a general risk screening procedure to help streamline the risk assessment process for new engines.

Response: SCAQMD staff does plan on developing a risk screening procedure to help streamline the risk assessment process for those facilities located more than 100 meters from sensitive receptors.

46. Comment: Many new engines emit diesel PM at rates equal to or less than 0.08 g/bhp-hr. What is the need for a one in one million risk "off ramp" if most new engines will have risk below one in one million?

Response: Proposed Amended Rule 1470 takes a pollution prevention approach to ensure exposure to diesel particulate matter from emergency standby engines to sensitive receptors is minimized. The decision to require that new engines achieve a Tier 4 PM emission limit is technology-based; based on the availability of diesel particulate filters and their ability to achieve this emission limit and ultimately reduce the health risk. Under Proposed Amended Rule 1470 engines that are located beyond 100 meters of a sensitive receptor, owners or operators will be required to demonstrate compliance with risk requirements under Rule 1401. An engine that has a lower emission rate will produce a lower health risk and can be used to comply with the risk levels of Rule 1401(d)(1)(A).

47. Comment: Proposed amendments will not result in reduced health risk since emissions from any new emergency engines are so low, as to be totally insignificant in terms of the cancer risk from diesel PM in the basin. Reduction of diesel PM from the rule will be insignificant given a reduction of about 0.12 grams PM and 30 hours of operation, so that if cancer risk is modeled, there is not likely to be any real change. As noted in ARB's Final Statement of Reasons for changes to the ATCM, the modeled cancer risk from a 0.15 gram/bhp-hr emergency engine without after-treatment is likely to be less than ten in one million. Finally, any potential real-world risk to an exposed person will

certainly be much lower than any modeled risk due to the conservative assumptions used for modeling.

Response: Implementation of Proposed Amended Rule 1470 will reduce the localized health risk associated with new stationary diesel emergency standby engines. SCAQMD staff agrees that the reduction in regional risk may be insignificant, however, those who live and work near the emergency standby engine will benefit from reduced health risk..

SCAQMD staff acknowledges that the modeled health risk for a "pre-Tier 4" engine that meets a PM emission rate of 0.15 g/bhp-hr is likely to be less than ten in one million based on CARB's health risk tables. SCAQMD staff believes that a health risk above one in one million is not health protective, particularly when there is a technology that has been demonstrated and is commercially available that can achieve a lower health risk. This approach is consistent with Rule 1401 which requires all new permitted sources to meet a health risk of one in one million and up to ten in one million if T-BACT is used. Proposed Amended Rule 1470 is a technology-based rule; based on the availability of diesel particulate filters and their ability to achieve a Tier 4 PM emission limit and ultimately reduce the health risk.
SCAQMD staff disagrees that "any potential real-world risk to an exposed person will certainly be much lower than any modeled risk due to the conservative assumptions used for modeling." For emergency standby engines only the testing and maintenance hours are assumed in the health risk calculation. Engine use that occurs during an emergency or outside of testing and maintenance hours is not included.

48. Comment: SCAQMD staff should provide further justification for toxic risk requirements in PAR1470. Please provide information on the following: baseline cancer risk from diesel fuel when the Diesel Risk Reduction Plan was adopted; the percentage reduction in risk from diesel exhaust from the date of DRRP adoption to present time; SCAQMD plans to achieve additional reductions in risk beyond the 85% goal of the DRRP; and how PAR1470 amendments will help to reach the 85% reduction in diesel risk in 2020.

Response: The purpose of requiring diesel PM emission reductions under PAR 1470 is to reduce the exposure to diesel particulate from emergency standby engines. Please see the Response to Comment #5 and Chapter 1 of this staff report for further explanation. In response to your questions regarding the DRRP and Basin-wide diesel PM risk, the California Air Resources Board adopted the "Risk Reduction Plan to Reduce Particulate Matter Emissions form Diesel-fueled Engines" (DRRP) in September 2000. SCAQMD's analysis in the September 2008 Multiple Air Toxics Exposure Study (MATES III) report estimated the Basin-wide average population-weighted cancer risk from all air toxic sources decreased from approximately 931 to 853 in a million between

1998 and 2006 and diesel PM was and continues to be the largest contributor to risk. Future MATES studies will further quantify the reductions in diesel PM risk. Compliance with state and local diesel PM reduction regulations are expected to reduce diesel PM emissions to meet or exceed the targeted 85% reduction. Many of the regulations have future compliance dates and Basin-wide diesel PM risk reductions will continue to be realized over the next decade.

49. Comment: Rule 1401 requirements should be disconnected from Rule 1470 and a separate Public Workshop should be held for Rule 1401. Some stakeholders for Rule 1401 may not have realized that Rule 1401 is being revised in Rule 1470, and thus neglected to participate in Rule 1470 workshops. Additionally, the proposed amendments to Rule 1470 make it very difficult, challenging, and confusing to understand SCAQMD rules. If the proposed amendments to Rule 1470 are adopted and the practice of amending one rule into another continues, the public will need to review and check all other rules to be sure what a particular rule states. PAR1470 references section (d)(1)(A) of Rule 1401, however, Rule 1401(g)(1)(F) exempts emergency engines from subdivision (d).

Response: Notices for the Public Workshop for PAR 1470 were sent to all holders of SCAQMD permits for diesel and other compression ignition engines; manufacturers, dealers and distributors of these engines; and other interested parties. The risk requirements were addressed in the Public Notice. Although Rule 1401 is referenced in Rule 1470, the requirement is specific to diesel engines. It is appropriate, therefore, to place it in PAR 1470 along with the other requirements for these engines.

50. Comment: The proposed requirements for new engines located at or less than 100 meters from a sensitive receptor are less stringent than the requirements for engines located >100 meters from a sensitive receptor, because of the requirements for compliance with Rule 1401 risk thresholds. Requirements for engines located <100 meters from a sensitive receptor should be more stringent.

Response: The PAR 1470 requirements for new emergency standby engines located within 100 meters of a sensitive receptor are more stringent than those for engines beyond 100 meters because compliance with current Tier 4 PM standards is required, regardless of the cancer risk. Essentially, most of these engines would require a diesel particulate filter. For engines located beyond 100 meters, only those with cancer risk greater than one in one million would be required to meet the current PM tier standards while those with a cancer risk of less than or equal to one in one million would only have to meet a PM emission standard of 0.15 g/bhp-hr, which can be met without after-treatment controls.

51. Comment: Please quantify the cancer risk from a person smoking a cigarette within 100 meters of a school. Please also quantify the risk to school occupants if sewage overflows expose students to raw sewage

Response: SCAQMD staff recognizes the danger of tobacco smoking to children. State law has prohibited smoking at public school facilities since 1986 (CA Education Code Sections 48990 and 48901) and prohibited smoking within 25 feet of playgrounds since 2001 (CA H&S Code Section 104495). The California Air Resources Board added Environmental Tobacco Smoke to the list of toxic air contaminants on January 26, 2010 without identifying a risk threshold which makes it difficult at this time to quantify the risk to students from tobacco smoke within 100 meters of a school.

It is also difficult to quantify the likelihood and risk to students of exposure to raw sewage. SCAQMD staff has worked with sanitation districts to identify potential options for their emergency generators, which may operate at low loads for long periods of time during emergencies, so that engine failures and resulting sewage overflows can be avoided.

SCAQMD staff recognizes the existence of various sources of health risks to the public. Health risks from diesel PM from stationary emergency engines, particularly for the most sensitive populations such as school children, have been quantified and PAR 1470 provides additional protection for sensitive receptors.

Direct-Drive Fire Pump Engines

52. Comment: The National Fire Protection Association (NFPA) requires independent third party certification of emergency engines used to drive fire pumps to ensure they meet all of the equipment, material, installation, and performance requirements NFPA standard number 20. Third party certification is done by two nationally recognized certifying agencies, Underwriter's Laboratory (UL) and Factory Mutual Research (FM) and the engines are typically referred to as UL/FM labeled. It is not possible to simply add an after-treatment device to a Tier 3 engine and then have a Tier 4 EPA certified engine. Developing and providing Tier 4 engines requires huge amounts of money and engineering time. Manufacturers cannot commercially justify the cost and the commitment of resources that would be incurred to develop UL/FM certified engines to Tier 4 for such a small market. We request that Proposed Amended Rule 1470 requirements for emergency direct drive fire pumps be fully aligned with the EPA New Source Performance Standards (NSPS) requirements.

and

Direct drive fire pumps have unique challenges in that they test at no load during weekly testing and, therefore do not reach temperatures sufficient to regenerate passive filters. During actual emergencies, they operate at higher temperatures and much higher exhaust flow rates which may lead to failure if the DPF is in a highly restricted condition from weekly exercise. The additional exhaust flow under these conditions will create excessive restriction (i.e., backpressure) on the engine preventing it from producing its rated horsepower and therefore preventing it from being able to drive the fire pump as necessary. Active DPFs require an external heat source which may also lead to failure during an emergency if the auxiliary heat source fails and restricts the exhaust flow creating the same situation as with passive DPFs.

and

Tier 4 engines should not be required for direct drive fire pumps. Tier 4 engines are dependent on exhaust after-treatment devices that present a significant risk that emergency direct drive fire pump engines will not be able to perform in an emergency as intended. They present an unacceptable risk and are not cost justified when compared to the emission reduction because of the low number of operating hours. This has been acknowledged by EPA when developing the NSPS, by the Engine Manufacturers Association, and NFPA. NFPA 20 paragraph 11.5.2.9 states that "Exhaust emission after-treatment devices, that have the potential to excessively restrict the flow of the engines exhaust, shall not be permitted."

Response: SCAQMD staff recognizes that emergency direct drive fire pumps differ from other emergency standby engines. Table 2 – Emission Requirements for New Stationary Emergency Standby Diesel Fueled Direct-Drive Fire Pump Engines provides the emission levels for these engines which do not require exhaust after-treatment devices for PM or NOx emissions. PAR 1470 requirements are somewhat more stringent than the NSPS requirements because direct drive fire pump engines that meet the standards of Table 2 are readily available.

Certified Equipment Permit Program

53. Comment: Engine manufacturers' pre-registrations were extended through 12/31/2011, indicating that existing engines would be compliant with AQMD requirements for new stationary emergency standby engines. Based on the pre-registration extension, industry stakeholders committed to orders for equipment, delivery schedules, building designs, and other construction project related items which would be difficult, if not impossible to undo.

and

SCAQMD should investigate how those applications which have been submitted pursuant to outstanding CEPs can be honored without further burdening applicants.

Response: New emergency standby engines installed in 2011 would not require after-treatment for NOx and PM which is consistent with the engine models currently certified under the Certified Equipment Permit program. Therefore, the current CEPs will be honored.

54. Comment: Proposed regulatory concepts may undo significant steps already taken with the Certified Equipment Program in streamlining the permitting process and reducing costs to permit applicants. SCAQMD should conduct technical sessions with stakeholders to determine how any changes to Rule 1470 can be implemented in a manner that preserves the CEP program and that otherwise minimizes permit application fees. Discussion topics should include streamlined indexing techniques to assess risk, utilization of generic equipment descriptions in CEPs, and permit conditions that appropriately reference federal stationary engine certification in place of California off-road engine certification.

Response: SCAQMD staff intends to maintain the CEP program and will work with stakeholders to certify engine models for 2012 and beyond.

Miscellaneous Public Comments

55. Comment: Viscon can be mixed with diesel fuel (1 oz. Viscon to 20 gal. diesel fuel) and reportedly reduces diesel PM, HC, and NOx emissions from diesel engines. Viscon consists of poly-isobutylene dissolved in diesel fuel, and is capable of lowering the combustion temperature of diesel fuel which results in more complete fuel combustion.

Response: Viscon is currently being tested to demonstrate emission reduction capabilities. SCAQMD staff supports new technologies which are shown to reduce emissions from diesel engines.

56. Comment: The District should consider exempting agencies that provide essential public services, such as public transit, from PAR1470

Response: SCAQMD staff has considered an exemption and, based on the availability and reliability of DPFs for new emergency standby engines, has determined that an exemption is not warranted.

57. Comment: Rule 1401(g)(1)(C) provides an exemption for functionally identical equipment and PAR1470 should provide a similar exemption

Response: In keeping with the goal of reducing diesel PM emissions and exposure to diesel PM, PAR 1470 does not provide an exemption for functionally identical equipment.

58. Comment: According to the definition of "new engine" in PAR1470, all engines installed after Jan. 1, 2005 will be required to comply with the PAR1470 requirements for PM controls and will need to be retrofit or replaced

Response: The definition of "new engine" reflects the language in the ATCM which has requirements for new and existing engines with the "new" requirements applying only to engines installed after January 1, 2005. Language has been added to PAR 1470 to clarify the applicability of amended requirements for new emergency standby engines. For example, clause (c)(2)(C)(ii) states that the PM emission requirements apply to emergency standby engines "installed or with an application for Permit to Construct or Permit to Operate deemed complete on or after January 1, 2011 and prior to January 1, 2012."

59. Comment: Text in the Preliminary Draft Staff Report Executive Summary stating that proposed amendments "delay compliance" with Tier 4 PM emission limits, should be revised to indicate that proposed amendments "waive compliance" with Tier 4 PM emission limits for engines installed in 2011.

Response: Currently Rule 1470 requires some engine ratings to meet Tier 4 emission standards. PAR 1470 provisions for new emergency engines installed in 2011 allow an additional year for these sizes of engines to meet Tier 4 emission standards for PM, thereby delaying compliance with the Tier 4 PM standards until January 1, 2012.

60. Comment: What is the justification for amendments to section (d)(7) - proposed amendments require a "monthly summary" of emergency engine usage instead of a "log of usage" and are existing records sufficient if facilities are already documenting the required components?

Response: The amended provision provides a less onerous method of recordkeeping for owners/operators of emergency standby engines. It is consistent with the amended ATCM and recognizes that fueling emergency engines differs from fueling of prime engines because fuel purchases may not take place on a regular basis as with prime engines. Rather than requiring a log of fuel usage, the amendment allows owners/operators of emergency standby engines to maintain fuel purchase records demonstrating that the fuel purchased and supplied to the engine or engines is a compliant fuel. A monthly summary of fuel purchased and supplied to the engines must be kept and available for SCAQMD compliance personnel.

61. Comment: What is the impact on the Draft Subsequent Environmental Assessment document if further changes to the rule language are made?

Response: Any proposed modifications to PAR 1470 that are made after the Revised Draft Subsequent Environmental Assessment (SEA) for PAR 1470 was released for public review will be analyzed and, if the analysis demonstrates that they would not trigger requirements for recirculation, the modification will be incorporated into the Final SEA for PAR 1470 could still be considered for adoption by the Governing Board.

62. Comment: What is the Rule 1470 applicability to stationary emergency standby engines fueled with Amber 363 fuel?

Response: Amber 363 is an alternative diesel fuel as described in definition (b)(3). Requirements for compression ignition engines operating with alternative diesel fuels are the same as those for diesel-fueled engines.

63. Comment: SCAQMD should include a sell-through provision (similar to the sell-through provision formerly incorporated into the State ATCM) in PAR1470 to allow permit applicants additional time to comply with the Tier standards as they transition from Tier 2/3 to Tier 4.

Response: PAR 1470 would not require new emergency standby engines to meet Tier 4 standards for NOx, VOC, HC, or CO emissions. PAR 1470 would require some new emergency standby engines to meet Tier 4 PM emission standards on or after January 1, 2012. The rule requires the current PM standards, however it does specify how the PM rate is to be met. Applicants have the option of using a certified Tier 4i or Tier 4 engine or they could use a Tier 2 or Tier 3 engine equipped with a DPF to meet the standard. This allows engines at any tier that meets 0.15 g/bhp-hr to continue to be sold and a sell-through provision is not needed.

64. Comment: Under the proposed amendments, would stationary emergency engines located >100 meters from a sensitive receptor only be required to meet a PM limit of 0.15 g/bhp-hr?

Response: Under PAR 1470, if the stationary engine is located more than 100 meters from a sensitive receptor, the PM emission limit is 0.15 g/bhp-hr if the owner/operator can also demonstrate that cancer risk from the engine does not exceed one in one million. If the cancer risk exceeds one in one million, the engine would have to meet the current tier 4 or tier 4 interim standard for PM emissions.

Public Comments Received After August 15, 2011

65. Comment: We support the proposed amendments to Rule 1470 and the air district for taking an important step beyond the U.S. EPA's NSPS and the ARB's Stationary ATCM to reduce PM emissions from new emergency standby engines. In particular, we believe the current real-world experience and results from demonstration programs indicate that diesel PM control technologies are capable of providing a wide range of reduction levels for standby stationary diesel engines.

Response: SCAQMD staff appreciates your comment. Since diesel PM is a carcinogen, SCAQMD staff believes it is important to reduce emissions and associated health risks from diesel PM exposure whenever feasible.

66. Comment: The proposed amendments to Rule 1470 set health based PM limits for certain new emergency standby engines that require PM exhaust emission controls. The emission control technologies, such as wall flow diesel particulate filters (DPFs) that are being considered to reduce PM emissions are commercially available and proven technologies that provide multi-pollutant co-benefits in addition to PM reductions of greater than 85% or 0.01 g/bhp-hr. Specifically, catalyzed diesel particulate filters, catalyzed flow-through filters and diesel oxidation catalysts effectively reduce PM by levels of 25% to 85% and also provide important co-benefits of reducing emissions of hazardous air pollutants, carbon monoxide, and volatile organic compounds.

DPFs, in particular, have been demonstrated to be very effective in reducing PM emissions from both mobile and stationary diesel engines. The use of high-efficiency DPFs (e.g., DPFs that use wall-flow ceramic filters) provides the maximum reduction in PM emissions, including black carbon emissions, and additional significant reductions in toxic HC emissions, VOCs and CO when catalyst-based DPFs are employed. FTFs and DOCs should also be considered as an alternative option to help achieve some level of PM control from this category of engines. We look forward to working with SCAQMD, the engine and equipment manufacturers, end-users, and others in implementing the changes proposed to Rule 1470.

Response: SCAQMD staff agrees that diesel particulate filters are a technologically feasible method of reducing diesel PM emissions from stationary emergency standby engines. When installed, maintained, and operated in accordance with manufacturers' specifications and CARB Executive Orders, CARB-verified DPFs are a reliable, effective technology to reduce diesel PM emissions from stationary engines. SCAQMD staff also acknowledges the co-benefits of emission reductions of HAPs, CO, and VOCs from the use of catalyzed DPFs.

However, reductions of non-PM exhaust contaminants were not included in emissions estimations for the proposed amended rule due to the variability in non-PM emission reductions achievable by various DPF manufacturers and because CARB Verified Diesel Emission Control Strategies are verified only for diesel PM emission reductions.

67. Comment: Since DPFs will accumulate soot over time, they must be regenerated intermittently. Both passive and active techniques can be used. Passive DPF systems regenerate using available exhaust heat and/or the oxidation of available engine-out NO to NO2, a powerful oxidizing agent for trapped carbon, to combust the soot during regeneration. Active DPF systems are specifically designed for low exhaust temperature applications and employ additional energy inputs to facilitate regeneration, such as diesel fuel injection strategies, engine throttling strategies, the use of electrical heating elements, or fuel burners. In addition, the use of a fuel-borne catalyst (FBC) in conjunction with uncatalyzed or lightly catalyzed DPF systems can help provide reliable filter regeneration, especially at lower exhaust temperatures.

In the rare number of stationary engine installations where the engine may have been oversized for the normal operating load, a load bank may need to be installed to achieve exhaust temperatures high enough for regeneration of the soot. The appropriate temperature may vary between DPF technologies but several manufacturers have experience with achieving sufficient regeneration temperature at 25% of maximum engine load and in some cases as low as 10% of full load. Although operating stationary engines at such low loads is not typical, nor recommended, DPF device manufacturers have developed catalyst formulations to accommodate low exhaust temperatures. The best technical solution for any application should be assessed on a case by case basis to properly size the device for the operating load and exhaust temperatures.

According to several DPF manufacturers, important design parameters to consider when determining the feasibility of installing a PM emission control system on a particular existing stationary diesel engine include:

- the substrate volume (which is tied in part to the engine-out PM levels and engine backpressure limits),
- the operating cycle/engine operating temperature (the temperature must be hot enough to ensure regeneration of the collected soot if using a passive regeneration strategy; otherwise, an active regeneration strategy may be necessary),
- the NOx-to-PM ratio of the engine exhaust stream (typically, a minimum of 16, with an optimum ratio of 20; this is a particularly important consideration if using a passive regeneration strategy), and
- the amount of lube oil consumed (too much lube oil will require more frequent cleaning of the filter).

Response: SCAQMD staff agrees that DPF manufacturer information indicates there are various emission control options available for stationary diesel engines, including engines that typically operate at low loads. Staff also agrees that each emission control solution should be evaluated on a case by case basis in order to determine the suitability of the emission control device for a particular application. SCAQMD staff has developed a draft DPF Guidance document (included as Appendix B to the Draft Staff Report), which includes general information and technical assistance regarding the selection, installation and operation of diesel particulate filters on stationary diesel emergency standby engines.

68. Comment: Diesel oxidation catalysts (DOCs) are another important and inexpensive emission control strategy for reducing pollution from stationary diesel engines. Typically using a very light loading of platinum catalyst on a monolithic support, they are able to oxidize CO, HC, and the soluble organic fraction (SOF) of PM in a diesel engine's exhaust stream. DOCs installed on engines have achieved total particulate matter reductions of up to 25 percent, HC reductions of 60 to 90 percent, and significant reductions of CO, smoke, and odor. Oxidation catalyst technology is a very cost effective emission reduction technology that has been extensively used on stationary lean-burn natural gas and lean-burn diesel engines to achieve significant reductions in HC, CO and PM emissions from these engines.

Response: SCAQMD staff agrees that diesel oxidation catalysts can provide emission reduction benefits when applied to stationary diesel engines. While DOCs are not likely to achieve the emission reductions necessary to comply with the most stringent Tier 4 final PM emission limits, when used alone or in combination with other emission controls, they may be an option for reducing diesel PM emissions and health risk from some stationary diesel engines.

69. Comment: Flow-through filter (FTF) technology is another available method for reducing diesel PM emissions from stationary diesel engines. FTFs employ catalyzed metal wire mesh structures or tortuous flow, metal foil-based substrates with sintered metal sheets and are capable of achieving PM reductions of about 50 to 75 percent. One manufacturer has verified an actively regenerating Level 2 device ideal for low exhaust temperatures typical of low load applications.

Response: SCAQMD staff agrees that flow through filters can provide emission reduction benefits when applied to stationary diesel engines. While FTFs are not likely to achieve the emission reductions necessary to comply with the most stringent Tier 4 final PM emission limits, when used alone or in combination with other emission controls, they may be an option for reducing diesel PM emissions and health risk from some stationary diesel engines.

70. Comment: In addition to PM emissions from a stationary diesel engine's exhaust stack, PM emissions from the engine's crankcase can be substantial (as much as 0.7 g/bhp-hr PM during idle conditions). To control these emissions, closed crankcase ventilation (CCV) systems have been installed, which return the crankcase blow-by gases to the engine for combustion. CCV systems virtually eliminate crankcase PM emissions (over 90 percent) during all engine-operating modes. U.S. EPA verified CCV systems are typically installed in combination with either a DPF or a DOC and are a cost effective way to achieve additional PM reductions.

Regarding experience with installation of closed crankcase ventilation systems on existing stationary diesel engines, one MECA member company reported that one manufacturer of CCV systems has been selling them for stationary diesel engines since the mid-1990s. On the mobile-source side, CCV systems have been successfully retrofit on a variety of diesel vehicles, including school buses, transit buses, and port trucks. In addition, EPA's 2007 highway diesel rule and Tier 4 regulations for nonroad diesel engines require that engine manufacturers employ crankcase emission controls on all new diesel engines.

Response: SCAQMD staff agrees that closed crankcase ventilation systems can provide emission reduction benefits when applied to stationary diesel engines. While CCVs are not likely to achieve the emission reductions necessary to comply with the most stringent Tier 4 final PM emission limits, when used alone or in combination with other emission controls, they may be an option for reducing diesel PM emissions and health risk from some stationary diesel engines.

71. Comment: Diesel particulate filters have been successfully used in many stationary applications, including prime stationary and emergency standby engines. PM emission reductions in excess of 85 percent are possible, depending on the engine's baseline emissions and duty cycle. In addition, up to a 90 percent reduction in carbon monoxide (CO) and a 95 percent reduction in hydrocarbons (HCs) can also be realized with catalyst-based DPFs operated on ultra-low sulfur diesel fuel. DPFs will also remove heavy metals, unless they are volatile (e.g., mercury).

We believe that exhaust emission controls are a commercially proven technology option for reducing emissions from in-use stationary diesel engines, including older (manufactured before 1996) and large (300 hp and greater) in-use stationary diesel engines. One of the key sources of information in support of the technical feasibility of applying emission controls to stationary diesel engines is the work conducted by the California ARB in support of its airborne toxic control measure (ATCM) for stationary compression-ignition engines (promulgated in November 2004). Level 3 (at least 85 percent or greater PM reduction) verified retrofit technologies, such as verified DPFs, provide the required PM reductions to meet these ARB ATCM requirements. ARB

determined that the PM emission standards under the ATCM were technologically feasible due to: 1) successful emission control experience with similar-sized off-road engines that had to meet the same PM standards; and 2) successful operation of approximately 50 stationary diesel-fueled engines with DPFs in California (the engines controlled represent a wide range of engine types, model years, horsepower ratings, and applications).

Several DPF manufacturers have experience with the application of DPFs to existing stationary diesel engines. DPFs have been successfully applied to stationary engines as small as 20 kW, as well as, to very large installations on emergency back-up or prime power generators with several megawatts of power. This experience base includes both passively and actively regenerated DPF systems. Another DPF manufacturer has had extensive experience with the retrofit of stationary diesel engines in Taiwan. Power outages are frequent in Taiwan, so standby generators used for emergency back-up power are an important part of the country's infrastructure. DPFs have been successfully installed on these generators. For example, Taiwan Semiconductor Manufacturing installed DPFs on 14 standby generators (2 MW engines) in 2001, which has resulted in a greater than 90 percent reduction in PM.

We provide the following as examples of DPF installations on stationary diesel-fueled engines:

- In July 2005, the California Energy Commission published a report, *Air Quality Implications of Backup Generators In California*, detailing the emission performance of back-up diesel generators with a variety of power ratings equipped with exhaust emission controls, including DOCs, passive DPFs, and active DPFs (a copy of this report is available at: www.energy.ca.gov/2005publications/CEC-500-2005-049/CEC-500-2005-049.PDF). The results of the demonstration program showed successful application of DPFs, DOCs, and emulsified fuels on engines ranging in age from two to 18 years old. Durability testing of the DPF and DOC systems for intermittent cold start and extended high load operation indicates that these technologies are effective for generator applications.

- In September 2005, J. Cloud Inc., a rock-crushing operation in El Cajon, California, installed DPF systems on their pre-1996 Caterpillar 3408 (0.2 g/bhp-hr PM) and Caterpillar 3306 (0.3 g/bhp-hr PM) engines. The 536-hp engine drives a hydraulic pump that powers a rock crusher and the 430-hp engine drives a generator that provides power for a conveyor. Each DPF system contains two filters and each was designed to match the engine size and exhaust conditions of the respective engine. The site operates eight hours a day for five days a week. The DPF systems have achieved PM reductions of 85 percent and CO reductions of 80 percent. In addition, the DPF systems run at a backpressure of approximately 15"

water column at full load and have only been cleaned once at 1,200 hours to remove accumulated ash from the filters.

DPFs have been successfully installed and used on mining, construction, and materials handling equipment where vehicle integration has been challenging. These nonroad applications include the use of both passive and active filter regeneration strategies. Over 20,000 active and passive systems have been installed on nonroad applications as either original equipment or as a retrofit worldwide. DPFs, many employing active regeneration strategies, have also been installed on over 100 locomotives in Europe since the mid-1990s.

Response: SCAQMD staff appreciates the information regarding retrofitting older engines with DPFs. Rule 1470 currently requires PM emission reductions for in-use prime engines and provided three compliance options and essentially requiring 85% PM emission reductions or achieving an 0.01 PM emission rate. Basically, all options required retrofitting prime engines with DPFs. The compliance dates for these engines have passed. Rule 1470 does not require in-use emergency standby engines to attain these low PM emission rates, but does require limited hours of operation based on the uncontrolled PM emission rates, thereby reducing PM emissions.